

REMARKS

Applicants' representatives thank Examiner Farahani for the courtesies extended during the telephone interview conducted on June 4, 2004. Applicants' separate record of the substance of that interview is incorporated into the following discussion.

Claims 1-4 and 13-16 are currently pending. Claims 1, 3 and 13 have been amended herein. Claim 1 has been amended for clarification and the amendment is supported throughout the specification. The amendments to claims 3 and 13 are supported by Fig. 6A and pages 19-21 of the specification.

Applicants' Response to the Rejections under 35 U.S.C. §103

Presently, claims 13 and 14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kepler et al.* in view of *Madurawe*.

In response thereto, Applicants have amended claim 13 to more distinctly express the style of the division of the alignment mark described in Figs. 6-8. Applicants respectfully submit that this claimed alignment mark is different from the alignment mark in Fig. 3 of *Kepler et al.*, and would not have been obvious in light of *Kepler et al.* in view of newly cited *Madurawe*.

Newly cited *Madurawe* discloses an alignment target shaped in an "L-character" in Figs. 2A-2B. The Office Action states that the alignment mark disclosed in *Madurawe* is formed in two directions perpendicular to each other. Based on this disclosure, the Office Action concludes that it would have been obvious to one of ordinary skill in the art of the time of the invention to make the alignment marks of *Kepler's* structure as two

perpendicular subsections in order to save space on the semiconductor body in which marks are formed.

Claim 13 has been amended to more accurately describe that the first direction is the direction that the plurality of the lines dividing the alignment mark extends, and that each of the plurality of the lines extending along the first direction is divided into a broken line having a plurality of segments. Claim 13 is intending to represent the alignment mark shown in Figs. 6-8 having the broken line pattern. This point is emphasized by the above-presented amendment adding a term of “broken line,” and removing language as to a “perpendicular” formation.

Applicants respectfully submit that *Madurawe* does not disclose the amended claim 13 limitations. The alignment mark disclosed in *Madurawe* is of an L-character shape having parts perpendicular to each other. That is, there exist two scribings perpendicular to each other in one continuous alignment mark. An alignment mark having a broken line pattern or a fragmented pattern is never disclosed in *Madurawe*. From this perspective, *Madurawe* is completely unrelated to the alignment mark expressed in amended claim 13.

Accordingly, Applicants respectfully submit that it would not have been obvious to one of ordinary skill in the art at the time of the invention to realize the alignment mark in claim 13 and its dependent claim 14 by combining *Kepler et al.* and *Madurawe*, even when the alignment mark disclosed in Figs. 2A and 2B of *Madurawe* is taken into consideration. Wherefore, favorable reconsideration is requested.

Claims 1-4 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Kepler et al.* in view of *Irie et al.*, and further in view of *Hwang et al.* Applicants

respectfully traverse on the basis that the resultant combination of the references does not result in the present invention.

The present invention according to claims 1-4 has features relating to the micronized pattern by which the alignment mark is divided, that (i) the micronized pattern has a size smaller than a resolution limit of an alignment sensor (hereinafter “the first feature”), and that (ii) the micronized pattern has a pattern forming margin larger than a device pattern formed over the semiconductor wafer has (hereinafter “the second feature”).

The Office Action maintains that the first feature is an obvious matter based on the technical idea of the density filter disclosed in *Irie et al.* However, as disclosed in the response to the previous Office Action, and as discussed during the telephone interview of June 4, 2004, Applicants respectfully submit that *Irie et al.* does not disclose the first feature of the present invention and the idea concerned with the density filter disclosed in *Irie et al.* is not equivalent to the first feature. The first feature offers a design of the alignment mark in which influences of the optical asymmetry of the alignment sensor (TIS, Tool Induced Shift) are reduced. The consideration of the optical asymmetry of the alignment sensor is requisite for realizing the first feature.

The Office Action maintains that this limitation would have been obvious in light of the teachings of *Irie et al.* Specifically, the teachings at paragraph [0066] and Figures 2A and 2B are referenced. As discussed in the interview of June 4, 2004, paragraph [0066] does not disclose alignment marks on a semiconductor nor the micropattern forming the alignment marks being less than the resolution limit of an alignment sensor. Paragraph [0066] does disclose dots on a density filter for the purpose of affecting a light

attenuating rate. However, there is no disclosure of an alignment sensor such as to view the dots or to make an alignment mark from the disclosed dots. Hence, there is no basis for combining the teachings of *Irie et al.* with *Kepler et al.* *Irie et al.* only teaches that dots on a density filter (not a semiconductor wafer and not forming an alignment mark) may have a size below the resolution limits of an optical system for affecting the light attenuating rate to the end product (*i.e.*, substrate, 4). Applicants respectfully submit that this teaching in combination with *Kepler et al.* does not result in the first feature (*i.e.*, the second element of claim 1).

The Office Action also regards the second feature as an obvious matter citing *Hwang et al.* Specifically, the Office Action maintains that a change in size is generally recognized as being within the level of the ordinary skill in the art. Applicants respectfully submit that *Hwang et al.* discloses neither pattern forming the margin of micronized pattern dividing the alignment mark larger than that of the device pattern, nor the relationship between pattern forming margins of micronized patterns. The second feature offers a design of the alignment mark in which influences of the physical asymmetry of the alignment mark (WIS, Wafer Induced Shift) are reduced. Such a technical feature is not the result of a mere change in size within the level of ordinary skill.

The combination of above-mentioned first and second features realizes a design of the alignment mark in which influences of both the optical asymmetry of the alignment sensor and the physical asymmetry of the alignment mark are reduced. The first and second features of the present invention are not reached without the inventors' assiduous consideration of the optical asymmetry of the alignment sensor and the physical

asymmetry of the alignment mark. That is, these features are not simple technical matters easily achieved by the combination of *Kepler et al.* and *Irie et al.* or *Hwang et al.*, because the first and second features are mutually related. Wherefore, Applicants respectfully request favorable reconsideration in light of the above remarks and the discussion at the interview of June 4, 2004.

Claims 15 and 16 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Kepler et al.* in view of *Madurawe*, and further in view of *Hwang et al.*

Claims 15 and 16 are dependent from either of claims 13 or 14 and it has been submitted above that the present invention according to amended claim 13 and claim 14 are not obvious over *Kepler et al.* in view of *Madurawe*. Therefore, Applicants respectfully submit that the present invention according to claims 15 and 16 would not have been obvious to one of ordinary skill in the art at the time the invention was made, even if the arts disclosed in *Hwang et al.* were further applied.

For at least the foregoing reasons, it is believed that this application is now in condition for allowance. If, for any reason, it is believed that this application is not in condition for allowance, Examiner is encouraged to contact the Applicants' undersigned attorney at the telephone number below to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

By: 
Scott M. Daniels
Reg. No.: 32,562
Attorney for Applicants
Tel: (202) 822-1100
Fax: (202) 822-1111

Attachment: Petition for Extension of Time w/fee
MJC/SMD/rer

Q:\2002\020171\Amendment - 1st OA due 6-25-04